

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application No. 10/775,889

Applicant: Schauer et al.

Filed: February 9, 2004

TC/AU: 1762

Examiner: Turocy, David P.

Docket No.: 226465 (Client Reference No. A 100 630g)

Customer No.: 23460

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY TO OFFICE ACTION

Sir:

In reply to the Office Action dated May 1, 2007, please enter the following amendments and consider the following remarks. This response is timely since it is accompanied by a petition and fee for a three-month extension of time for filing a response pursuant to 37 C.F.R. § 1.136(a).

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 4 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

1. (Currently Amended) A method of coating the surface of substrates, comprising the steps of:

bringing a solution of a polymer having derivatized hydroxyl and/or carboxyl groups and/or CN, halogen, and/or amino substituents in a solvent into contact with the surface of the substrate; and

converting the polymer to a polymer form that is less soluble in said solvent by subjecting said derivatized hydroxyl and/or carboxyl groups or CN, halogen and/or amino substituents to a solvolysis reaction; and

thereby depositing the less soluble polymer form on the surface of a substrate in a manner involving more than just adsorption on the surface of the substrate.

2. (Previously Presented) The method as claimed in claim 1, wherein the solvolysis reaction is carried out only partially.

3. (Currently Amended) The method as claimed in claim 1, wherein the polymer has side chains and/or a backbone chain comprising unsaturated groups ~~in at least one of a side chains and a backbone chain.~~

4. (Previously Presented) The method as claimed in claim 1, wherein the polymer exhibits active groups and/or forms the same during the solvolysis reaction, which groups serve to immobilize the polymer.

5. (Previously Presented) The method as claimed in claim 1, further comprising the steps of coating the surface of the substrate with the polymer and immobilizing the polymer, by means of a crosslinking reaction following the solvolysis reaction.

6. (Previously Presented) The method as claimed in claim 5, wherein the crosslinking reaction is a free-radical reaction or an addition or condensation reaction.

7. (Previously Presented) The method as claimed in claim 4, further comprising the step of washing the surface of the substrate following immobilization of the polymer.

8. (Previously Presented) The method as claimed in claim 1, wherein the substrate is a particulate substrate and that the polymer has a molar mass of from 1,000 to 50,000 g/mol.

9. (Previously Presented) The method as claimed in claim 1, wherein the substrate is a flat substrate and that the polymer has a molar mass of from 1,000 to 500,000 g/mol.

10. (Previously Presented) The method as claimed in claim 8, wherein the particulate substrate is selected from the group comprising pigments, fillers, fibers, nano particles, and particles of colloidal or micellar systems.

11. (Previously Presented) The method as claimed in claim 1, further comprising the step of coating the surface of the substrate with a nano layer of a polymer.

12. (Previously Presented) A substrate having a polymer-coated surface, produced by a method as claimed in claim 1.

13. (Cancelled)

14. (Previously Presented) The method as claimed in claim 1, wherein the substrate is a metallic substrate.

15. (Previously Presented) The method as claimed in claim 14, wherein the substrate is made of steel, galvanized steel, aluminum, or an aluminum alloy.

16. (Previously Presented) The method as claimed in claim 1, wherein the substrate is a particulate substrate, selected from the group comprising pigments, fillers, fibers or lamellar particles, nano particles, and particles of colloidal or micellar systems.

17. (New) A method of coating the surface of substrates, comprising the steps of: bringing a solution of a polymer having derivatized hydroxyl and/or carboxyl groups and/or CN, halogen, and/or amino substituents in a solvent into contact with the surface of the substrate; and

converting the polymer to a polymer form that is less soluble in said solvent by subjecting said derivatized hydroxyl and/or carboxyl groups or CN, halogen and/or amino substituents to a kinetically controlled solvolysis reaction; and

thereby depositing the less soluble polymer form on the surface of a substrate in a manner involving more than just adsorption on the substrate surface.

18. (New) A method of coating the surface of substrates, comprising the steps of: bringing a solution of a polymer having derivatized hydroxyl and/or carboxyl groups and/or CN, halogen, and/or amino substituents in a solvent into contact with the surface of the substrate; and

converting at least a portion of the polymer to a polymer form that is insoluble in said solvent by subjecting said derivatized hydroxyl and/or carboxyl groups or CN, halogen and/or amino substituents to a kinetically controlled solvolysis reaction; and

thereby depositing the insoluble polymer form on the surface of a substrate in a manner involving more than just adsorption on the substrate surface.

19. (New) The method as claimed in claim 18, wherein the solvolysis reaction results in substantially all the insoluble polymer form being deposited on the surface of the substrate.

20. (New) A method of coating the surface of substrates, comprising the steps of: bringing a solution of a polymer having derivatized hydroxyl and/or carboxyl groups and/or CN, halogen, and/or amino substituents in a solvent into contact with the surface of the substrate; and

converting the polymer to a polymer form that is less soluble in said solvent by subjecting said derivatized hydroxyl and/or carboxyl groups or CN, halogen and/or amino substituents to a solvolysis reaction and thereby depositing the less soluble polymer form on

the surface of a substrate in a manner involving more than just adsorption on the surface of the substrate,

wherein the deposition of the less soluble polymer on the substrate surface yields a coating on the substrate having a controlled thickness.

*REMARKS/ARGUMENTS**The Pending Claims*

Currently pending claims 1-12 and 14-20 are directed to a method of coating surfaces of a substrate. Reconsideration of the pending claims is respectfully requested.

The Amendments to the Claims

Claim 1 has been amended to further clarify that the inventive method involves converting a polymer to a less soluble polymer form via solvolysis reaction and thereby depositing the less soluble polymer form on the surface of a substrate *in a manner involving more than adsorption*. This amendment is supported by the instant specification at, for example, page 2, lines 28-30 (English translation).

Claim 13 has been canceled, without prejudice or disclaimer of the subject matter therein.

New claims 17-20 have been added. New independent claim 17 is similar in scope to amended claim 1 and recites the additional feature that the solvolysis reaction is "kinetically controlled." The kinetic control of the solvolysis reaction is described in the original specification at, for example, Example 1, page 7, line 11, and Example 2, page 9, lines 23-27.

New independent claim 18 is similar in scope to claim 17 and recites the additional feature that "at least a portion of the polymer" is converted to a "polymer form that is insoluble in said solvent" by the kinetically controlled solvolysis reaction. Claim 18 further specifies that the insoluble polymer form is deposited on the surface of a substrate. New claim 19 is dependent on claim 18 and further recites that the solvolysis reaction results in substantially all the insoluble polymer form being deposited on the surface of the substrate. These amendments are supported by the instant specification at, for example, page 2, lines 25-31, generally at pages 5-6, as well as Examples 1-2.

New independent claim 20 is similar in scope to claim 1 and recites the additional feature that the deposition of the polymer yields a coating on the substrate of controlled thickness. This amendment is supported by the instant specification at, page 2, lines 28-30, as well as page 6, lines 5-6.

No new matter has been added by way of these amendments.

Summary of the Office Action

Claims 11 and 13 are objected to as being substantial duplicates under 37 CFR 1.75. Claims 1, 3-5, 7-8, 10, 12, 14, and 16 stand rejected under 35 U.S.C. § 102(b) as anticipated by Bugnon et al. (i.e., EP 0 528 602). The Office Action further rejects claims 1, 3-5, 7-8, 10, 12, 14, and 16 as obvious over 35 U.S.C. § 103(a) over Bugnon in view of Finch (i.e., "Hydrolysis of Polyvinyl Acetate to Polyvinyl Alcohol")(incorrectly referred to as Noro in the Office Action). Claims 2, 6, 9, 11, 13, and 15 stand rejected as obvious over various combinations of Bugnon, Finch, Marie et al. (i.e., "Controlled Solvolysis of Ethylene-Vinyl Acetate Copolymers"), Peng et al. (i.e., "Addition Polymerization," Encyclopedia of Polymer Science and Engineering, vol. 1, New York, pp. 470-71), Cox et al. (i.e., U.S. Patent 3,393,162), and Herman et al. (i.e., U.S. Patent 3,884,871).

Discussion of the Double Patenting Objection

The double patent objection is moot in view of the cancellation of claim 13 and accordingly should be withdrawn.

Discussion of the Anticipation and Obviousness Rejections

The anticipation and obviousness rejections are respectfully traversed.

Bugnon fails to teach or suggest all of the elements of the invention recited in the pending claims. Bugnon is directed to a method of improving storage stability of colored organic pigment particles comprising coating the pigment particles with a polymer. The method for coating such particles taught by Bugnon involves mixing a solution or dispersion of the polymer in a liquid with a dispersion of the pigment particles "until pigment particles are coated with the polymer." Bugnon, page 2, lines 56-58. Bugnon teaches two methods of coating: (1) the coating "may be as a result of adsorption of the polymer on the surface of the pigment" and (2) "the polymer may be precipitated from a solution thereof onto the pigment particles by addition of a precipitant salt." Bugnon, page 3, lines 8-13.

1. Depositing does not mean mere adsorption

The Office Action asserts that the term depositing "encompasses adsorption" because the term "deposit" is alternately defined as "to be placed, inserted, precipitated" that "deposit" is equivalent to "adsorption" which "applicants contend that adsorption is the putting down of or the placing of materials on the surface of a substrate by surface energy"

(emphasis added). In addition, the Office Action asserts that the specification fails to define the term depositing. Applicants respectfully disagree with the assertions of the Office Action. First, the definition of "deposit" as meaning "to be placed, inserted, precipitated" is not equivalent to an accumulation of polymer on a substrate surface as a result of attractive bonding forces between a particular polymer and substrate which cause the two to come together. Second, contrary to the assertion of the Office Action, the specification does provide a definition for "depositing." Specifically, as previously stated, the instant specification makes clear that deposition means "more than just adsorption." See page 2, lines 28-30. Accordingly, even if the term depositing is defined in certain contexts as encompassing "just adsorption," the Applicants have made clear in the specification that such a limited definition of "depositing" is not what is intended. Rather, as clearly set forth in the specification, depositing is more than adsorption alone. The claims, as amended, further make clear that the term "depositing" involves more than just adsorption thus explicitly distinguishing the method taught by Bugnon.

2. *The pending claims do encompass the invention*

The Office Action additionally argues that the language "less soluble" in the context of the claim does not necessarily translate into precipitation. Applicants respectfully disagree. While in general it is true that in some cases a polymer may be rendered less soluble but still be in solution, in the context of the pending claims, the solvolysis reaction which converts a polymer to a form that is less soluble results in deposition of the less soluble polymer form on a surface of a substrate. Accordingly, the pending claims taken as a whole make clear that the less soluble polymer form is deposited on the substrate surface in a manner involving more than just adsorption which inherently means that the less soluble polymer is insoluble under the particular reaction conditions. By way of contrast, adsorption does not require that a polymer become insoluble, or even less soluble, because adsorption can occur from a solution.

3. *The method taught by Bugnon does not necessarily result in the invention*

The Office Action further asserts that because Bugnon discloses a hydrolysis reaction, it is unclear how the pending claims differ from Bugnon. The pending claims recite that the polymer of the solution is converted to a polymer form that is less soluble by a solvolysis reaction "thereby depositing" the less soluble polymer form on the surface of the substrate. In other words, the solvolysis reaction is the direct mechanism by which the polymer is

“thereby” deposited onto the surface. Bugnon does not disclose deposition of a polymer onto a substrate by means of a solvolysis reaction as is recited by the pending claims. Although Bugnon suggests that polyvinylalcohol polymer “may be formed in situ by hydrolysis of a vinyl acetate polymer in a dispersion of the pigment,” nothing in Bugnon teaches that the reaction conditions of such a solvolysis reaction should be such that the hydrolysis results in polymer form that is less soluble and which is deposited on the surface of a substrate. To the contrary, Bugnon teaches that the coating should be achieved by adsorption or, alternatively, by precipitation via addition of a precipitant salt. See Bugnon, page 3, lines 8-10.

Accordingly, one of ordinary skill in the art following the teaching of Bugnon would carry out the hydrolysis reaction under solvent, concentration and temperature conditions appropriate to induce adsorption or would further add a precipitant salt so as to induce uncontrolled precipitation resulting in undesirable polymer flocculation. Indeed, one of ordinary skill in the art would be lead away from the invention recited in the pending claims because the artisan would choose conditions that were not appropriate for inducing deposition in a manner involving more than just adsorption.

The method recited in the pending claims has a number of advantages over the adsorption and salt induced precipitation methods taught by Bugnon. First, multiple layers of polymer can be built up on a substrate surface in a controlled manner following the method recited in the pending claims. See, specification at, e.g., page 2, paragraph 5; page 4, last paragraph. A coating consisting of multiple layers is not possible via mere adsorption that relies on available surface energy because, once the available bonding sites on the surface are used up, no further layers are formed via adsorption. Second, because according to claim 1 the less soluble form of polymer is “thereby” deposited onto the substrate in a finely controlled manner, uncontrolled precipitation or flocculation of precipitant randomly in the solution does not occur, as would happen if precipitant salt were added to the solution. Hence, the remainder of the polymer that is not converted to a less soluble form and thereby deposited onto the substrate form remains stabilized in the solution thus counteracting flocculation. See, specification pages 4-5.

4. *The additionally cited references do not render the claims unpatentable*

Finch (incorrectly referred to as “Noro” in the Office Action), Marie et al., Peng et al., Cox et al., and Herman et al. fail to cure the deficiencies of Bugnon. While Finch discloses that polyvinyl acetate may be converted to polyvinylalcohol and precipitated from a solution

by a solvolysis reaction, such a reaction results in pure, flocculated polyvinyl alcohol particles. Finch provides no disclosure about employing a solvolysis reaction to “thereby” deposit polymer onto the surface of a substrate or how this depositing could occur in the controlled manner according to claim 1, especially “in a manner involving more than just adsorption.” Applicants hence submit claim 1 is patentable over Bugnon and Finch. Similarly Marie et al., Peng et al., Cox et al. and Herman et al. each fail to teach a method of coating a substrate by means of a solvolysis reaction as recited by the pending claims.

Since Bugnon alone or in combination with Finch, Marie et al., Peng et al., Cox et al. and Herman et al., fails to disclose each and every element of the invention recited in the pending claims, the anticipation and obviousness rejections are improper and should be withdrawn.

Discussion of the Newly Added Claims

Newly added claims 17-20 are believed to be patentable for all the reasons discussed above. In addition, claims 17-20 are patentable for the reasons set forth below.

New claim 17 additionally requires that the solvolysis reaction is “kinetically controlled.” Kinetic control is the mechanism by which the less soluble form of polymer is “thereby” deposited onto the surface of the substrate in a finely controlled manner. In contrast to mere adsorption which is limited to formation of a single layer, or uncontrolled precipitation which results in wasteful polymer flocculation, multiple layers of the polymer having a controlled coverage and thickness can be built up on the substrate by kinetically controlling the reaction. Accordingly, claim 17 is further patentable over the prior art of record.

New claim 18 additionally recites that at least a portion of the polymer is converted to an insoluble form that is deposited on the surface of a substrate. Claim 18 thus further distinguishes Bugnon in which coating of the substrate by adsorption of a polymer may occur wholly apart from the conversion of a soluble polymer form to an insoluble form via solvolysis reaction. Claim 18 also distinguishes Bugnon in which the coating may occur by precipitation of large amounts of flocculated polymer. Therefore, claim 18 is further patentable over the prior art of record.

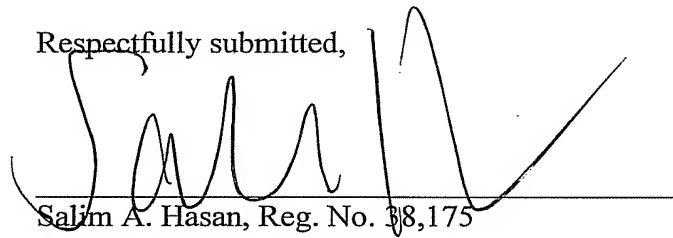
New claim 20 additionally recites that the deposition of the polymer resulting from the solvolysis reaction yields a coating of a controlled thickness. Claim 20 thus further

distinguishes Bugnon which teaches coating a substrate only by adsorption or by uncontrolled precipitation using a precipitant salt. Nothing in Bugnon teaches a method of controlling the solvolysis reaction so as to achieve a coating having a controlled thickness.

Conclusion

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Salim A. Hasan', is written over a horizontal line.

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